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ABSTRACT

A program for teaching children and adults the thinking skills most important in everyday life is described. This program, which has been tried out and evaluated in the United States, France, Germany, England, Australia, Japan, and Israel, is needed in every school and community as a "gymnasium for the mind," to help people fully use their natural intellectual potential, just as a regular gymnasium helps people fully use their physical potential. The program uses games to develop the skills of deductive logic, inductive logic, planning, remembering, creative thinking, problem solving, visualization, and communication. Most of the games use a kit containing number cards, letter cards, picture cards, shape and color cards, and a playing board. The kit can be bought or can be easily constructed. An example of one of the games--an abstract game of deductive logic--is included. Each kit game is presented at several levels from simple to more difficult and can, therefore, be used with various age levels. The publication ends by listing and answering nine commonly asked questions about the program. (Author/RM)

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# MUSCLES OF THE MIND
## An International Program to Improve Thinking

Abstract

Muscles of the Mind is an international program for teaching the thinking skills most important in everyday life, such as logic, strategy, memory, creativity, problem solving, planning and communication. As an interdisciplinary program for children and adults, Muscles of the Mind requires no prior knowledge or special equipment.

By using games, which reflect all life activities, as the main teaching tool, the program keeps the students well-motivated. Through play, one develops and practices organized, efficient and productive thinking habits, and becomes able to acquire new knowledge more easily.

This program is needed in every school and community as a "gymnasium for the mind" to help people fully use their natural intellectual potential, just as a regular gymnasium helps people fully use their physical potential.

The program has been developed, tried out and refined by Marco Meirovitz (the inventor of the game MASTERMIND) in the United States, France, Germany, England, Australia, Japan, and Israel.

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## Teaching Thinking Skills Through Games

Perceptive educators realize that most of what they teach quickly becomes out of date. They see a rapidly-changing technological world around them. They understand that it is more important for people to learn how to discover facts, how to think creatively, how to gather, classify, analyze and evaluate information, how to set priorities, make decisions, and solve problems than to just learn facts. In short, they see a major aim of education is to provide students with tools for effective thinking, rather than to help them acquire more knowledge.

They recognize, furthermore, that some basic thinking skills are common to most if not all professions. One uses thinking skills, for example, to obtain and use information to find out what is wrong in a situation:

-A patient may have any of thousands of different disorders. The physician, by inquiring about symptoms, by observing the patient, and by making laboratory tests can determine what the actual disorder is.

-A car mechanic has the same kind of problem when a customer brings in a car that has something wrong with it.

-A restaurant chef (or person cooking at home) whose dish does not turn out satisfactorily must find out what went wrong.

All three cases involve the same thinking skill, deductive logic. The better-trained professional will analyze the information and eliminate possibilities more quickly, isolating the problem, incurring less expense, and exposing others to less risk.

By teaching people to use the proper thinking tools and to practice the most commonly used thinking skills, we can help them to develop their intellectual potential, to improve their performance, and to acquire new knowledge more easily and with greater understanding.

Our intention is to help people attain habits of systematic and effective ways of thinking. We can shorten the period of time needed for professional training if we can teach the most important thinking skills in a direct, concentrated, and pedagogically efficient way.

## The Need for a New Program

Most parents depend on the schools to teach their children important thinking skills and problem-solving habits. Too often, however, the schools haven't changed basically in hundreds of years. Students are taught to passively acquire knowledge to pass tests and to please the teacher. Instruction is aimed at the "average" student, so the better students are bored, and the less capable can't follow. In short, the schools lack curriculum

materials and trained teachers to improve their students' thinking skills.

The schools today concentrate on helping the students to acquire knowledge. But the aims of education should be to develop the student's intellectual potential, improve thinking skills, and prepare the student for life. By taking this approach, knowledge will be acquired more easily, and with better understanding. We have to prepare the student to enter professions ten or more years later whose features we cannot now begin to guess.

The Muscles of the Mind Program meets this curriculum need by providing the tools that teachers can use to make the most of each student's potential.

## Origin of the Program

In 1965 the inventor Marco Meirovitz pioneered the teaching of thinking skills through games by proposing to put a "gymnasium of the mind" into every school. While many educators resisted this idea, Meirovitz persisted. His pedagogical methods were based on considerable practical experience in teaching children and training technicians in workshops and demonstrations held around the world.

Meirovitz' invention of the game MASTERMIND was a major step forward in the development of the Muscles of the Mind Program. It made available a simple but effective, enjoyable tool for teaching deductive logic. MASTERMIND has met with overwhelming acceptance, becoming the third best-selling game in this century. At the same time, games in general have won a place as teaching tools in most schools.

The program was further developed, tried out and refined in the United States, France, Germany, England, Australia, Japan, and Israel. Thus the program stems from extensive field experience, rather than from armchair theorizing. Materials for this program are available in Meirovitz and Jacobs (1982, 1983, 1985).

## Assumptions of the Program

The MMP assumes that all people are born with the ability to learn and improve their thinking skills. The program further assumes that this improvement will be facilitated if people are given the opportunity to practice thinking skill with the right tools, in the right atmosphere, and using the right pedagogy.

## Goals of the MM Program

The goals of the Muscles of the Mind Program are:

-to develop and strengthen habits of efficient, systematic, and productive thinking
-to stimulate and develop natural intellectual potential

-to increase self-confidence
-to promote better teaching and learning, making life easier for students, parents, and teachers
-to allow people an easier adjustment to rapid technological changes
-to prepare them to face all school, home, and work situations more easily.

The program diagnoses our thinking abilities within a dynamic situation and provides the tools for improving thinking. It does not attempt to produce "supermen" or champion game-players. But it does help the students to use most of their individual potential and better prepares them for life.

Games as a Basic Tool for Improving Thinking Skills

Games, puzzles, activities, and exercises are the central feature of the Muscles of the Mind Program. They are used as the main tools for developing the skills. These are their advantages:

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a. Games are fun and provide motivation for playing. On their own initiative, people often spend their leisure time playing games. Each game presents a challenge, and an opportunity for the joy of achievement. Playing games develops confidence and encourages curiosity about the world.

b. Games reflect life. They contain all the basic skills we need in our everyday lives, such as memory, strategy, logic, creativity, communication, and problem-solving.

c. Games require one to actively exercise one's thinking skills. Just as one cannot learn tennis well by just talking or reading about it, one cannot develop one's thinking skills without actually using them.

d. Games, like physical activities, can be played at different levels to match the players' abilities. Everyone can participate and enjoy playing. The learner begins a game at a comfortable level, and gradually moves to higher levels as his/her self-confidence increases.

e. Playing games is a social process in which one learns to communicate, cooperate, and compete, as in real life situations.

f. Research has shown the value of games for learning. Most schools and universities today use simulation games as an effective instructional method.

g. Games promote the use of the imagination and the trying out of new roles.

| h. Through games one's experiences in life are enlarged and one's personality is developed. |
|---|

## Description of the Program

### The General Pedagogical Approach

The essence of the Muscles of the Mind Program is a set of games, presented in a way that makes the learner want to play, helps him or her learn how to play, and gives practice applying what was learned in the game situation to other life situations.

Games are the best tool for giving practice in thinking skills when they are used in a pedagogically appropriate way:

- -choosing the right game for the right age
- -choosing the right game level for each student
- -presenting progressively more difficult situations as mastery is obtained
- -analyzing the playing of the games and the thinking processes used
- -reaching conclusions on what has been learned from the games
- -discussing the application of principles from the games to other situations.

The teacher's role in the MMP, therefore, is to serve as a guide: choosing the right games and levels, coordinating the playing of the games, changing games and levels when needed, and leading discussions. The teacher functions like a coach in sports: showing the students how to practice so that they improve themselves and reach the highest levels they are capable of.

Some people avoid playing games because they seem too complicated. Even a "complicated" game, however, is based on simple easy-to-learn elements. The student in the MMP begins with a simple version of a game so that he or she catches on to the rules easily and immediately enjoys playing. Only when the student has mastered the simple version are complications introduced, such as more playing pieces, a larger playing field, more complex rules.

The purpose, of course, is not just to introduce many new games that are enjoyable to play, but rather to teach some general principles from these games that will improve thinking skills and to show the learner how to transfer these principles to real-life situations.

The psychological literature indicates that people need help applying to other situations what they learn in one situation. For each major thinking skill, therefore, the program has students apply the skills they have learned to other situations, including situations in their own lives.

## The Importance of the Context of Learning to Transfer

Often we learn a principle in a particular context and then cannot separate it from that context and apply it in other contexts and situations. That is why the Muscles of the Mind Program provides practice for each general thinking skill in a variety of games, puzzles, and other activities, uses different materials, such as numbers, letters, shapes and pictures, and appeals to different modes of learning, such as visual, verbal, abstract, and motoric.

## The Kinds of Games

The Muscles of the Mind Program uses games where thinking, not chance, makes the difference. Old games that have entertained people in many civilizations, as well as new games, have been put into a pedagogical format and adapted to the program.

The MMP also uses other activities: puzzles, excercises and experiments.

## The "Muscles" of the Mind

The word "muscles" in the program's name is a deliberate attempt to evoke an analogy: mental functioning, as well as physical functioning, can be improved by appropriate "exercise." It is relevant here to mention the observation of the anthropologist Caillois (1961) that "In a general way, play is like education of the body, character or mind... For it does not teach facts, but rather develops aptitudes."

## Pedagogical Features

The Muscles of the Mind Program has these pedagogical features:

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a. All the games are designed to be fun so that learners are well-motivated.

b. Each activity is presented at several levels from simple to more difficult. You can move to a higher level for greater challenge or to a lower level if the activity is too difficult. Each person can practice according to his/her own needs.

c. The pedagogical format of the program helps people overcome their reluctance to exercise their minds, and allows them to maximally exploit their natural intellectual potential.

d. The program helps people to develop and exercise the major thinking skills we use in our daily lives.

e. Players practice each major skill in many different games and activities so that the skill is not bound to a single context. Then they then learn how to apply the skill to solve everyday life problems.

f. By playing these games to exercise the mind, players develop effective thinking habits. Good thinking becomes as automatic as riding a bicycle or driving a car. People get into the habit of using thinking skills in the most effective and productive way, so as to make the most of their intellectual potential.

g. The games allow anyone, children as well as adults, to play, enjoy and benefit from them. The whole family together, groups, and individuals can all use the program.

h. Some people learn better when the instruction is in an abstract format, others when it is in a visual format, and still others when the instruction is in a verbal format. The complete program provides something for each kind of learner.

i. The teaching and learning are accomplished through activity, discovery, and discussion. Students learn through their own experiences and mistakes and those of others.

j. Playing games is a social process in which students are also learning skills of cooperative interaction.

k. People need no specific prior knowledge to use the program.

l. The program is interdisciplinary, applicable and adaptable to all school subjects, professional and vocational activities.

m. The program can be used to assess a person's intelligence under highly motivating conditions. The program provides a dynamic view of intelligence and personality and can be used as a supplement to the static IQ test.

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Evaluation of the Program

With practice the players can move with confidence to higher levels and apply what they have learned to new situations. They change their ways of thinking and acquire habits of good thinking. Their thinking becomes unblocked. They see clearly the progress they have made. Since their improvement in thinking skills is self-evident, an elaborate statistical study is not required to evaluate the program.

Miscellaneous Considerations

Age. In general, thinking skills can be improved at all ages by appropriate methods. As a practical matter, the Muscles of the Mind Program works best with students from age nine through adult. At all ages the thinking process is the same; only the game materials or the problems dealt with differ for the different ages.

Skills. While the Muscles of the Mind Program does help facilitate social skills and interaction through the playing of games, it is primarily aimed at improving cognitive skills, not affective skills.

Teacher training. Any major curriculum innovation requires considerable training of teachers to be successful. The Muscles of the Mind Program reduces this requirement by restricting the role of the teacher to that of a guide, not a master game player. Teachers receive training through books, workshops, and videotapes. The program also provides computer software to allow the students to play and practice on their own without requiring teacher supervision.

Competition. Some educators say that games should not be used extensively in the classroom because they may foster too much of the competitive spirit. Competition, however, is an inherent part of sports in our society, and of our society itself. Furthermore, even competitive games teach cooperative values: one learns to play according to the rules, one is encouraged to reach agreement about changing the rules, and, above all, one learns to communicate with others in a socially acceptable manner.

## The Thinking Skills

The Muscles of the Mind Program concentrates on these important skills:

Deductive Logic (Using Information). How to put together separate but related facts, eliminate irrelevant information, and reach a conclusion that must be so.

Inductive logic (Discovering Rules). How to discover rules by carefully observing what is similar and different among many events.

Planning. How to make plans, anticipate events, and organize efficiently to reach broad goals and to accomplish daily tasks.

Remembering. How to remember what has been learned and what one wishes to remember.

Creative Thinking. How to develop new and different ideas.

Problem solving. How to create new ideas through critical

thinking and logic and to make appropriate decisions.

Visualization. How to see in space, to imagine changes in spatial relations, to transfer images from two dimensions to three dimensions, and to observe carefully.

Communication. How to transmit a clearly understood message, and how to avoid misunderstandings and misinterpretations.

For most of these skills, the program provides abstract, visual and verbal games to help each kind of learner.

In the Muscles of the Mind Program the student concentrates on each skill separately, just as one might separately practice serving, forehand strokes, and backhand strokes to improve one's tennis game.

Of course these thinking skills do not exist in isolation. For example, one uses memory when thinking deductively, and one uses logic when planning strategy. Many other skills also play a part in our approach: decision-making, seeing ahead, setting priorities, taking risks, prediction, patience, and speed of reaction. Students learn these as well through the Muscles of the Mind Program although particular learning activities are not pinpointed for each.

## Commonly Asked Questions About the MMP

### 1. WHAT EDUCATIONAL PURPOSES CAN THE MMP BE USED FOR?

The MMP helps students improve in the thinking skills mentioned above. It also can be used to teach subjects, such as math and geography, and with simulation, to teach an activity.

### 2. WHERE CAN YOU USE THE PROGRAM?

You can use the program in schools at all levels: primary, secondary, college, and professional.

As a teacher, you can use the program to assign your class homework which is fun to do.

You can also use it in other instructional settings: in business, industry, and professional continuing education.

You can use it in workshops for teachers and parents on how to help children improve their thinking skills.

You can also use it outside of the usual school and instructional settings: for example, in summer camps, and in social clubs.

Finally, families playing together in the home, parents guiding their children, and individuals seeking self-improvement can all use the program.

3. HOW LONG DOES THE PROGRAM TAKE?

This depends on the setting and the purpose for which the program is used.

-A workshop to provide the basics needed by teachers to use the program in their classroom requires 32 hours.
-For regular use by students in the classroom, we recommend three or fours hours per week for six months.
-A thorough home course requires 64 hours.
-When used in clubs as a social or recreational activity, the time taken can vary to fit in with other activities.

The times given above are for presentation of the material. Students will need additional time to practice the thinking skills on their own.

4. WHAT MATERIALS DO I NEED FOR THE MMP?

The basic materials for all the activities in the program are everyday objects such as paper, pencils, a ruler, crayons, scissors, cardboard, ordinary playing cards, coins, buttons, watches, matchboxes, newspapers, and magazines.

Many of the games have been put into a playing card format to minimize the cost of using the program, and to provide familiar materials for both children and adults around the world. Decks of cards can simulate through games almost all our daily life activities that require thinking.

Most of the games use a kit containing:

-64 number cards (ordinary playing cards),
-64 letter cards,
-64 picture cards,
-64 shape and color cards, and
-a playing board.

The kit can be inexpensively bought or can be easily constructed.

5. DOES THE PROGRAM USE COMPUTERS TOO?

Computer software is available to give the students extra practice playing the games in the program. But it is not essential to have a computer and software to use the MMP.

6. WHO PLAYS THE GAMES, AND AGAINST WHOM?

The games in the program can be played:

-by the teacher against the entire class. This is frequently done when a game is first introduced to the class.
-by groups of players (2 or more) against each other in the classroom. This lets each student be more actively involved in each move than when the teacher plays against the whole class.
-by the student by himself/herself, in the case of many of the games. This allows for practice without time pressure.
-by the student as a homework assignment against friends, neighbors, and family members.

7. WHAT SPECIAL QUALITIES DOES A TEACHER NEED TO USE THIS PROGRAM?

To use this program effectively with students, you must have the same qualities as any good teacher in any program. You have to be a good "coach" and a good pedagogue to know how and when to best guide the students to make the most of their potential.

-You must have a basic understanding of what you are teaching.
-You must be sensitive to the backgrounds, abilities, and personalities of your students.
-You must know how to make lessons pleasant, how to motivate the students, and how to avoid boredom.

You do not, however, need to be a master player of games or a super-thinker yourself. In this program the teacher is like a sports coach. You provide guidance to help each student reach his/her full potential.

8. WHAT EXACTLY IS THE ROLE OF THE TEACHER?

First of all, as a guide you arrange for each student in the class to play the particular game at the particular level to best help him or her in the skills that need improvement.

Secondly, you lead discussions to stimulate the students' thinking skills, to analyze the thinking process together with the students, and to help the students get into the habit of using their skills.

Thirdly, you help the class to see ways to apply principles from the games to their own lives, and you assign students homework to apply what they have learned.

9. WHAT MAJOR STEPS DOES THE TEACHER TAKE IN ACTUALLY PRESENTING A LESSON?

a. Review and Warm-up: Go over previous lesson and homework, set the right atmosphere for the new lesson.

b. Introduce skill: Speak about skill in general, state the problem. List the abilities to be developed.

c. Introduce the game, analyze it.

d. Provide practice, discuss.

e. Arrange for play at different levels, from different angles.

f. Discuss the principles or concepts in the game, and the more general thinking skills involved. Give the students practice applying these general skills to other situations. Summarize.

## An Example of a Game and What it Teaches

In this section we present the rules of one game, analyze the playing of that game, and describe what can be learned from the game and applied to other situations.

### An Abstract Game of Deductive Logic

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*Aim of the game.* To find out the ranks of some secret cards.

*Number of players.* Two.

*Materials needed.* The aces through fives from two decks of cards; some tokens.

*How to play.* Player A secretly writes down two different ranks of cards (such as *ace* and *five*). Player B chooses two cards to get information about, and places them face up in a row. Player A places one token alongside this row for each card in it that has the same rank as one of the secret cards.

The game continues, with Player B choosing further rows and Player A giving information by means of tokens, until Player B finds out the ranks of the two secret cards.

Player A receives one point for each row of cards Player B needed. Then the players switch roles: Player B chooses the secret cards, and Player A must find them out. After a number of rounds, the player with more points wins.

*Variation.* Player A chooses three, instead of two, secret cards, and uses the aces through tens, instead of just the aces through fives.

*Variation.* Player A chooses four, instead of two, secret cards, and uses the aces through kings, instead of just the aces through fives.

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Here's an example of how this game is played:

-Player A chooses an ace and a three as secret cards.
-Player B selects a five and a three to get information about as the first row.
-Player A places one token (represented by an asterisk below) alongside the row to indicate that one of the cards in the row has the same rank as one of the secret cards.

5 3 *

-The game continues with Player B choosing another pair of cards.

The record of the game for Player B's first three choices looks like this:

5 3 *

2 5

3 4 *

Player B's thoughts during this game might be:

"To begin with, the secret cards could be any of these pairs:

| | | | |
|---|---|---|---|
| 1-2 | 1-3 | 1-4 | 1-5 |
| | 2-3 | 2-4 | 2-5 |
| | | 3-4 | 3-5 |
| | | | 4-5 |

"The results of the first row show that either a five or a three (but not both!) is a secret card. So I can eliminate those pairs that don't contain either a five or a three. I will erase them. This leaves me:

| | | | |
|---|---|---|---|
| | 1-3 | | 1-5 |
| | 2-3 | | 2-5 |
| | | 3-4 | |
| | | | 4-5 |

"The results of the second row show that neither the two nor the five is a secret card. So I can eliminate all the pairs that contain a two or a five. This leaves me:

1-3

3-4

The results in the third row show that either the three or the four (but not both!) is a secret card. If the only possibilities left are 1-3 and 3-4 and it's not 3-4, then it must be 1-3.

Player B tries 1-3, and Player A puts two tokens down to indicate a correct answer.

Transfer to other Situations

From this game and its higher level variations, the player learns a number of thinking skills, each of which is important in scientific research, in schoolwork, and in everyday life:

-To enumerate all the possibilities in the situation.

"To begin with, the secret cards might could be any of these pairs..."

Application to Language Arts: The sentence "I gave him the book I read yesterday" could have several meanings. The possibilities:

-I did the reading yesterday, or
-I did the giving yesterday, or
-I did both the reading and the giving yesterday.

Application to Chemistry: A gas is observed to be given off during an experiment. "The gas in this reaction could be oxygen, chlorine or carbon dioxide."

-To be systematic

"I will keep track of my progress by erasing possibilities as they are eliminated..."

Application to Arithmetic: To find the lowest common denominator of 5/6 and 1/16, I will in turn multiply 16 by 1, by 2, by 3, by 4, by 5, and by 6.

-To be efficient

"Even though the result for the second row was negative, I was able to use it to eliminate five of the seven possibilities."

Application to Language Arts: "I find many words begin with 're,' 'con,' and 'pre.' By learning what these prefixes mean I will efficiently be able to figure out the meanings of many new words.

-To use if-then reasoning

"If the only possibilities left are 1-3 and 3-4, and it's not 3-4, then it must be 1-3."

Application to Economics: "If an item becomes less available (the supply decreases) and the demand for it remains the same, then its price will increase. If a frost reduces the orange crop and the demand for oranges remains the same, the price of oranges will increase.

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